Phosphorus Compounds as Condensed Phase Flame Retardants for Polymer-based Materials

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Abstract

This lecture begins with a brief review of the history of use of phosphorus-based flame retardants, and considers the main classes of such species in use today, such as elemental phosphorus, inorganic phosphates, and alkyl and aryl phosphates and phosphonates. The types of polymer material in which these various types of flame retardant are commonly employed are also covered. The lecture continues by outlining what is known about the mechanisms of action of such flame retardants in both the gas and condensed phases.

Evidence for both gas phase and condensed phase action is exhibited in many phosphorus-based flame retardant/polymer systems and this is exemplified in the lecture by reference to work being carried out within the IMRI at the University of Bolton on the action of some aryl phosphates when incorporated in thermosetting blends of unsaturated polyesters with phenolic resins, and by reference to published work from other groups. The criteria that have generally to be met to ensure condensed phase as opposed to gas phase action (or vice versa) in phosphorus-based flame retardant/polymer systems are outlined.